

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Carrier Current Systems, including Broadband over Power Line Systems	)	ET Docket No. 03-104
	)	
Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems	)	ET Docket No. 04-37
	)	
To the Commission:	)	

**Via the ECFS**

**COMMENTS OF CARL R. STEVENSON – WK3C**

I, Carl R. Stevenson, WK3C, hereby respectfully submit these Comments in the above-captioned Proceeding.<sup>1</sup>

I am the holder of an Amateur Extra Class license issued by the Commission and have been licensed as an amateur radio operator by the Commission for over 25 years. Additionally, I have been an RF Systems Engineer for over 32 years and hold well over a dozen patents in the area of radio communications related circuits and systems technologies.

I am an interested party in this Proceeding and I appreciate the opportunity to offer these timely filed Comments.

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<sup>1</sup> Notice of Proposed Rulemaking (the "NPRM") in ET Docket No. 04-37, (FCC 04-29, released February 23, 2004).

## INTRODUCTION

1. I am very concerned that the Commission is, in the instant Proceeding, considering rules – *without sufficient technical justification* – that would, in the final analysis, prematurely facilitate and promote the widespread proliferation of Access BPL.

2. For the following reasons, and based on my best professional judgment, I respectfully, but strongly urge the Commission to take a much more cautious approach regarding Access BPL:

- Most importantly, based on direct personal experience and field measurements with calibrated instrumentation that I have made in an access BPL “trial area” located about 5 miles from my home, I have very serious concerns about the ability of this technology to adequately protect the many and varied licensed users of the high frequency (“HF”) spectrum – *including many uses that are critical to national security, homeland defense, and emergency and disaster communications* – from serious and widespread harmful interference.<sup>2,3</sup>
- Furthermore, in my best professional judgment, I believe that Access BPL systems operating in the HF spectrum will also be subject to interference from the licensed users of the HF spectrum, potentially rendering the solution a less reliable means of delivering the quality of broadband service than the American public both deserves and will increasingly demand.
- I also believe that “*the promise of Access BPL to provide the solution to broadband access in rural America*” alluded to in the NPRM is more marketing hype and wishful thinking on the part of the proponents of BPL than a technically and economically viable solution to the delivery of more ubiquitous broadband access in rural America.
- Finally, I also have doubts that Access BPL will, because of the impairments inherent in the transmission medium, be able to “scale” to meet the public’s ever-increasing demand for higher data rates and greater system capacity.

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<sup>2</sup> See “Attachment 1” hereto, which contains a brief report on my personal field measurements of the interference caused to HF communications by Access BPL in the Emmaus, Pennsylvania “BPL pilot area” operated by Pennsylvania Power and Light (“PP&L”). I expect to file more a more complete report either during the Reply Comment period, or as an ex-parte presentation.

<sup>3</sup> *It is important to note as the reader considers these comments and the attachment* - that the “trial area” referenced in footnote 2 above is a *very* small deployment with a very small number of users, and, as such, should not be considered representative of a full-blown commercial deployment of Access BPL. A full-blown commercial deployment of Access BPL would both encompass a *much* larger geographical area and more subscribers – *resulting in significantly larger areas of power lines acting as distributed antennae and significantly more user traffic on those lines* – both of which are factors that will only exacerbate both the amount of area affected and the levels of interference generated in those areas.

3. I am disappointed that the Commission, despite requests from Members of Congress and interested parties, chose to proceed with this NPRM before the release of a report from NTIA on the results of a rather extensive program of field measurements they have been conducting regarding the interference potential of Access BPL. I believe that, *had the information contained in the NTIA report been available sufficiently before the comment deadline in this Proceeding to permit a thorough review and analysis of its contents*, it would have been a valuable resource for the public in the formulation of its comments.

### **INTERFERENCE FROM ACCESS BPL TO LICENSED USERS**

4. As stated above, based on my own personal field measurements and observations, I have very serious concerns about the ability of this technology to adequately protect the many and varied licensed users of the high frequency (“HF”) spectrum.

5. The HF spectrum that Access BPL proponents propose to use *on an unprecedented scale* for unlicensed, unintentional radiator, “carrier current” systems is a unique, irreplaceable global resource that deserves special protection. Only in this narrow sliver, relatively speaking, of the electromagnetic spectrum is global ionospheric propagation of radio signals (without reliance on vulnerable infrastructure such as satellites, terrestrial repeaters, etc.) possible.

6. Thus, this portion of the spectrum is “home” to many critical communications services – *including military, homeland defense, emergency and disaster, aeronautical and maritime mobile, and amateur radio, amongst other vital services*<sup>4</sup> – services whose needs and mission requirements simply cannot be met in any other portion of the spectrum.

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<sup>4</sup> While some may mistakenly feel that amateur radio is “just a hobby,” government and private emergency management agencies view it differently. Amateur radio is recognized by the Department of Homeland Defense, the Federal Emergency Management Agency, the American Red Cross, the Salvation Army, and many state and local government agencies as an important and integral part of their communications plans for emergency and disaster situations where the safety of life and property can, and frequently does, depend on the ability to communicate “any time, anywhere,” an ability that the amateur community is widely recognized for being able to provide when needed.

See, as examples, the Statement of Affiliation Between the Federal Emergency Management Agency and the ARRL, signed June 21, 2003; the article Amateurs “First of the First Responders,” Department of Homeland Security

7. Assertions by the proponents of Access BPL that “*power lines don’t radiate as antennas*” are simply contrary to well-established electromagnetic radiation theory. These claims have also been proven false by both studies and field measurements, including field measurements that I have conducted myself.<sup>5</sup>

8. Furthermore, the existing radiated emission limits in the Commission’s rules for unlicensed “carrier current” systems operating as unlicensed devices in this portion of the spectrum were developed many years ago, taking into consideration a limited number of localized, essentially point source radiators. These limits clearly did not contemplate, let alone take into account systems such as Access BPL *that are intended to employ what are, in fact, geographically widespread distributed antenna systems that radiate at (at least) the prescribed levels virtually everywhere they exist.* Thus, the unique, unforeseen (at the time the limits were established) nature of Access BPL renders the current radiated emissions limits inadequate to afford the necessary level of protection to licensed uses of the HF spectrum.

9. Therefore, I am very concerned – *even convinced* – that if Access BPL is deployed widely, it will seriously disrupt those many critical services that can only be accommodated in the HF spectrum because of the unique propagation characteristics of that portion of the spectrum. This is clearly a preventable “tragedy of the commons” that the Commission should not permit to occur.

10. However, I am very doubtful that the Commission’s proposals for “interference mitigation” in the NPRM are adequate in terms of being effective or resulting in timely resolution of interference problems in practice.<sup>6</sup>

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Official Says; and the article FEMA and Red Cross Acknowledge Importance of Amateur Radio at: <http://www.arrl.org/FandES/field/mou/FEMA-ARRL-SOA1.pdf>, <http://www.arrl.org/news/stories/2003/06/24/2/>, and <http://www.arrl.org/news/stories/2002/06/06/1/> respectively.

<sup>5</sup> See Attachment 1 hereto.

<sup>6</sup> For many of the critical HF communications services at risk, “timely” means “NOW!” not “tomorrow” or “next week.”

**INTERFERENCE TO ACCESS BPL FROM LICENSED USERS AND RELIABILITY  
OF SERVICE ISSUES**

11. As stated above, I believe that there is sufficient evidence to indicate that Access BPL systems operating in the HF spectrum will also be subject to interference from the licensed users of the HF spectrum and therefore may be less reliable than other options for the delivery of broadband services.

12. I am aware of and have reviewed the report on empirical field experiments conducted by Amateur Radio Research and Development Corporation (“AMRAD”) that indicate that Access BPL systems are subject to disruption of service by relatively low-powered transmissions by licensed users of the HF spectrum.<sup>7</sup>

13. Additionally, as the Commission points out in the NPRM, Access BPL systems operating under Part 15 of the Commission’s rules must cease operation if they cause interference to licensed users – something that I believe will become a common occurrence if Access BPL is widely deployed and the Commission insists that the operators of Access BPL systems strictly adhere to this rule.

14. Both of these factors raise the question “*Is Access BPL capable of providing the level of reliability of broadband service that the American public both deserves and will increasingly demand?*” (And, conversely, if it may not be, why the rush to encourage its widespread deployment without further study and adequate, appropriate safeguards?)

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<sup>7</sup> See, “*Additional Reply Comments by the Amateur Radio Research and Development Corporation (AMRAD)*”, filed with the Commission in its NOI (ET Docket No. 03-104) at:  
[http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native\\_or\\_pdf=pdf&id\\_document=6515383154](http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6515383154)

**THE PROSPECT OF SERVING RURAL AMERICA ECONOMICALLY VIA ACCESS  
BPL APPEARS TO BE DUBIOUS AND THE COMMISSION SHOULD, AS A MATTER  
OF POLICY, FOCUS ITS EFFORTS AND RESOURCES ON PROMOTING MORE  
PROMISING OPTIONS THAT ARE READILY AT HAND**

15. I also believe that, in light of the very nature of Access BPL, “*the promise of Access BPL to provide the solution to broadband access in rural America*” alluded to in the NPRM (and promoted by the proponents of Access BPL) amounts to little more than “marketing hype” designed to persuade the Commission to “fast track” this Proceeding.

16. In sparsely populated areas, the costs associated with the need for rather closely spaced repeaters on the power distribution lines<sup>8</sup> will likely render Access BPL an economically unviable solution.

17. As an example, at “tutorial” on BPL at the March 2004 IEEE 802 Local and Metropolitan Area Network Standards Committee plenary in Orlando, Florida, the system block diagrams presented by BPL industry representatives clearly indicated that repeaters would be necessary approximately every 300 meters along the medium and high voltage transmission lines. It difficult to understand how rural customers – *many such repeater spans apart* – could be served economically, given the requirement for so much infrastructure per user.

18. Thus, I believe it is likely that Access BPL will only be economically viable, if at all, in areas that have sufficient potential user densities to *already* be served by – *or be good candidates to be served by* – alternative, *non-interfering* solutions such as cable modem, DSL, wireless broadband access systems at much higher frequencies, and, eventually, fiber to the home or business.

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<sup>8</sup> This requirement is an artifact of the fact that the transmission medium - medium and high voltage power distribution lines - were never designed to carry, and are poorly suited for carrying, high speed data signals.

19. In fact, to the best of my knowledge from publicly available information, all of the Access BPL deployments to date are located in suburban or urban areas, *many of which are already served by cable modem and/or DSL providers*. Thus, it appears to me to be entirely plausible to speculate that the real motivation for Access BPL providers is simply to attempt to capture market share from existing alternative providers *in areas that are already served, or likely to be served in the near future*, by more appropriate, non-interfering alternatives.

20. While it may be true that any additional option for broadband access might promote competition, how many competitors are really necessary to assure that users have choice and thereby benefit from lower costs as a result of competition?

21. I believe that broadband wireless access systems, with local or regional access points fed by fiber or inexpensive microwave links for “backhaul,” present a much more economically feasible, practical, suitable, *and non-interfering solution* for delivering broadband services to truly rural areas than “wired” solutions such as Access BPL are ever likely to be able to realize, because this alternative will require much less infrastructure per user.

22. Therefore, I encourage the Commission to focus its efforts intended to bring broadband services to rural areas on making sufficient amounts of spectrum, with suitable propagation characteristics, available for such broadband wireless access solutions.

**ACCESS BPL IS UNLIKELY TO “SCALE” BEYOND “LEGACY” DATA RATES AND  
THUS APPEARS UNLIKELY TO BE CAPABLE OF MEETING THE FUTURE  
BROADBAND NEEDS OF AMERICA**

23. I also question whether Access BPL will, because of the impairments inherent in the transmission medium, be able to “scale” sufficiently to meet the public’s ever-increasing demand for higher data rates and greater system capacity.

24. The very nature of Access BPL’s transmission medium – *medium and high voltage power distribution lines that were never designed to carry high frequency, high speed data signals* – inherently makes that medium a very hostile operating environment with very high noise levels, impedance discontinuities, and a host of other impairments.

25. I believe that, because of this unusually hostile environment and despite the advancement of technology, Access BPL systems – *in particular if appropriately constrained to operate at power (and corresponding radiated emissions) levels that will adequately protect the licensed users of the HF bands* – will inevitably encounter fundamental limits of physics that will “cap” their transmission speeds well below those that will be attainable by other broadband delivery methods that operate in less hostile and non-interfering transmission environments.



**SETTING COMMENT DEADLINES ON THE NPRM PRIOR TO REASONABLE  
PUBLIC ACCESS TO THE NTIA REPORT HAS PLACED THE PUBLIC AT A  
DISADVANTAGE IN FORMULATING ITS COMMENTS IN THIS PROCEEDING**

26. As stated above, I am disappointed that we, and the public at large, have not had the opportunity to adequately review and analyze the material in NTIA's report on its study of Access BPL and its interference potential prior to the comment deadline for the NPRM, despite the fact that at least one Member of Congress and other parties have asked the Commission to await the results of NTIA's studies before proceeding with the instant NPRM.

27. I believe that a thorough review and analysis of the data in the NTIA report will provide valuable information that interested parties should have had an opportunity to consider in the formulation of their initial comments in this Proceeding.<sup>9</sup>

28. In light of this, I ask the Commission to extend the Reply Comment deadline by at least 30 days, and preferably 45 days, beyond its current date of June 1, 2004 to afford interested parties sufficient time to review and consider the content of the NTIA report, and other technical studies that I expect to be submitted in the initial comment phase, as they formulate their reply comments.

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<sup>9</sup> The NTIA report only recently became publicly available – a mere 5 days (only two business days) prior to the deadline for comments set by the Commission – clearly an insufficient amount of time to adequately review, digest, and consider the implications of the material in such a voluminous report.

## **SUMMARY AND CONCLUSION**

29. Given the growing body of technical evidence at hand, I have very serious concerns about interference *to* the licensed users of the HF spectrum, as well as concerns about interference to Access BPL systems *from* those licensed users and the potential impact of such interference on the ultimate reliability of Access BPL as a means of delivering broadband services to users.

30. I also note that, as the Commission reaffirms in the NPRM, should Access BPL systems cause interference to the licensed users of the HF spectrum they use on an unlicensed basis, those systems will be *required* to cease operations unless/until such interference can be remedied. This poses a risk of unpredictable losses of service to users – a risk that I believe many potential users, *if aware of it*, would find unacceptable. Certainly, at a minimum, if access BPL is to be widely offered to businesses and consumers – *with appropriate technical constraints to assure the protection of licensed users of the HF spectrum* - providers offering Access BPL services should be required to *clearly* explain this risk to potential customers *before* customers are induced into entering into service agreements.

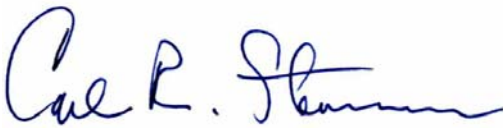
31. I question the assumption that Access BPL will be able to meet its “promise” of providing a ubiquitous, economically viable solution to the delivery of broadband services in rural areas and believe, as stated above, that broadband wireless access systems, operating at higher frequencies, present a much more practical, economically viable, and reliable solution to providing broadband services in such areas (as well as providing another competitive option in more densely populated suburban and urban areas).

32. It also appears doubtful to me that Access BPL will be able to “scale” in data rates, in comparison with alternative technologies, to meet the public’s ever-growing demand for higher data rates.

33. In light of the aforementioned interference concerns, reliability concerns, questions as to whether Access BPL will *truly* be able to serve rural America, and questions as to whether it will be able to meet the longer term data rate and capacity needs of the public, I urge the Commission to proceed cautiously in formulating rules that appear to be designed to not only facilitate, but actively promote the widespread proliferation of Access BPL.

34. Finally, since the NTIA report has just become available a few days before the initial comment deadline in this Proceeding, we ask the Commission to extend the deadline for reply comments by *at least* 30 days beyond the current deadline to allow interested parties sufficient time to review and consider the content of the NTIA report, and other technical studies that I expect to be submitted in the initial comment phase, in the formulation of their reply comments.

Respectfully submitted,

A handwritten signature in blue ink, reading "Carl R. Stevenson". The signature is fluid and cursive, with the first name "Carl" being the most prominent.

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## **ATTACHMENT 1**

### **REPORT OF FIELD MEASUREMENTS OF INTERFERENCE TO HF COMMUNICATIONS FROM THE PP&L ACCESS BPL "TRIAL AREA" IN EMMAUS, PENNSYLVANIA**

#### **Introduction**

On April 30, 2004, I, Carl R. Stevenson, WK3C, made a series of measurements comparing HF reception in an area with normal background RF noise levels (in the range of -105 to -110 dBm in a 3 kHz measurement bandwidth, limited by the spectrum analyzer's noise floor) to the HF reception found in the Access BPL "trial area" operated by PP&L in Emmaus, Pennsylvania.

In terms of my experience and qualifications to make such measurements, I submit the following:

- I hold an Amateur Extra class license issued by the Commission,
- I hold a Commercial Radiotelephone license issued by the Commission,
- I have, for over 32 years been employed as an RF designer and systems engineer by entities such as Rockwell/Collins Defense Communications, Symbol Technologies, the Communications Systems Research Section of NASA's Jet Propulsion Laboratory, Lockheed Corporation, Lucent Technologies, and Agere Systems,
- I have consulted on RF communications system design for entities such as Hughes Satellite Systems, Loral Corporation, Westinghouse Electric, and others,
- I hold over a dozen patents in the area of RF circuits and systems,
- I am experienced both with the equipment and the techniques for making such measurements with accuracy and repeatability.

#### **Description of the Test Methodology**

The test methodology employed was as follows:

With a recently factory-calibrated IFR AM/FM 1200S service monitor (a calibrated synthesized receiver/signal generator with integral spectrum analyzer) and a small whip antenna at a height of approximately 2 meters above ground (mounted temporarily on a vehicle and using a ¼ wavelength counterpoise), I selected and tuned to single sideband ("SSB") signals in the range of -80 to -100 dBm in the 20m amateur band, both in an area with normal RF noise levels and in the vicinity of power lines carrying Access BPL signals in the Emmaus, PA "trial area".

Additionally, I performed the same measurements and comparisons using NIST's WWV time and frequency standard station at both 10 MHz and 15 MHz as the "victim" signal at the same locations.

## **Objectives**

The objective of these measurements was several-fold:

- 1) To demonstrate that HF signals at the above-stated levels could be received and demodulated in perfectly usable condition with the test equipment in use, when the test system was located in an area with normal ambient RF noise levels,
- 2) To determine if signals at the same levels were subject to harmful interference when the test system was located in proximity to power lines being driven with Access BPL signals,
- 3) And, to measure the level of interference received from the Access BPL system, both relative to normally usable HF signals and the absolute level of interference from the Access BPL system, as received by the test system.

## **Preliminary Results**

(I intend to make additional measurements and submit a more detailed report in the future.)

- 1) It was verified that HF SSB and AM signals from the 20 meter amateur band and from WWV on 10 MHz and 15 MHz could, in fact, be demodulated in clearly readable and perfectly usable condition at signal levels in the -80 to -100 dBm range (as measured by the spectrum analyzer) when the test system was located in an area with normal ambient RF noise levels (the receive sensitivity of the instrument is not as good as a normal, good quality HF communications receiver and the system noise floor of the spectrum analyzer is the limiting factor at about -110 dBm).
- 2) The test system was then moved into the PP&L BPL trial area in Emmaus, PA and similar measurements were conducted there.
- 3) In the BPL trial area, signals in the -80 to -100 dBm signal strength range were totally unusable because they were 20-40 dB below the level of interference received as radiated BPL emissions from the power lines.
- 4) The absolute level of the BPL interference was measured at -55 to -60 dBm in a 3 kHz bandwidth.
- 5) It should be noted that the short whip antenna used for these measurements is inefficient and the BPL signal levels received on a similarly-located full-size dipole would be somewhere in the range of 6-15 dB higher than measured on the short whip antenna.
- 6) The use of a 3 element yagi as the receiving antenna (an antenna commonly used by amateur radio operators) would result in the reception of signals approximately 8.5 dB higher yet.
- 7) It should also be noted that -60 dBm is 13 dB above "S9," which is specified by the ITU as representing -73 dBm, which is considered a VERY strong signal indeed. Below S9, each "s-unit" represents 6 dB, and it is routine for amateurs and other users of HF to conduct, and rely on being able to conduct, perfectly acceptable communications with signals at "S1" or lower.

## **Conclusions**

The Access BPL system being operated by PP&L in the Emmaus, PA area radiates interfering signals that would be received by an amateur, or other licensed user of the HF bands using commonly-used antenna configurations, at levels that very conservatively would be well above (20-30 dB or more) signals at levels that are routinely used for communications – including emergency communications. *This would clearly constitute "harmful interference."*